

CLAIMS

1. An energy delivery system for delivering energy to a content in a vessel, the system having:-
- 5 (a) a contactlessly-powerable energy emitting device which:-
- (i) is adapted to be:-
- positioned inside the vessel, and
  - contactlessly-powered when inside the
- 10 vessel to emit energy to the content, and
- (ii) has a control mechanism adapted in use to control the operation of the energy emitting device in accordance with a prescribed regime;
- 15 and
- (b) a power supply adapted in use to contactlessly-couple with the energy emitting device for powering thereof when inside the vessel.
- 20 2. The system of claim 1 wherein the energy emitting device is adapted to emit energy which, in use, affects a condition of the content and the control mechanism is adapted in use to operate to vary the amount of energy emitted by the device to control the
- 25 content condition affected by the energy.
3. The system of claim 1 or 2 wherein the energy emitting device is adapted in use to emit thermal energy to the content.

4. The system of any one of the preceding claims wherein the device is a self-contained device.

5 5. The system of any one of the preceding claims wherein the energy emitting device is comprised in a stirrer.

6. The system of claim 5 wherein the stirrer is a contactlessly-drivable stirrer.

10

7. The system of claim 5 or 6 wherein the stirrer has an external casing defining a sealed inner volume inside of which the energy emitting device is located.

15 8. The system of claim 5 or 6 wherein the stirrer has an external casing which presents an external stirrer surface on which the energy emitting device, or an energy emitting part thereof, is mounted.

20 9. The system of any one of the preceding claims wherein the energy emitting device is electrically-powerable and the power supply is adapted in use to contactlessly provide electrical power to the device.

25 10. The system of any one of the preceding claims wherein the device has an electrically-powerable energy emitting element which, in use, emits energy in response to electrical current provided thereto under control of the control mechanism.

30

11. The system of any one of the preceding claims wherein the device and power supply are adapted to be inductively coupled for powering the device.
- 5 12. The system of any one of the preceding claims which further has a base unit in which the vessel is holdable and which includes the power supply.
- 10 13. The system of claim 12 when appended to claim 6 wherein the base unit has a contactless drive mechanism for contactlessly driving the stirrer.
- 15 14. The system of any one of the preceding claims wherein the control mechanism is able to vary the amount of energy emitted by the device.
- 20 15. The system of any one of the preceding claims in which the control mechanism has a pulse width modulation (PWM) controller for controlling operation of the energy emitting device.
- 25 16. The system of any one of the preceding claims wherein the control mechanism has a programmable controller which is programmed to cause the energy emitting device to operate in accordance with the prescribed regime.
- 30 17. The system of claim 10 or any one of claims 11 to 14 when appended to claim 10 wherein the control mechanism is an electrical control circuit operatively coupled to the electrically-powerable energy emitting

element for controlling operation thereof in accordance with the prescribed regime.

18. The system of claim 17 wherein the control  
5 circuit includes a controller.

19. The system of claim 17 or 18 wherein the electrical control circuit is adapted to be contactlessly-coupled with the power supply for  
10 forming a contactless power transfer link.

20. The system of any one of the preceding claims further having a sensor to produce condition signals representative of a condition of the content.  
15

21. The system of claim 20 wherein the sensor forms a part of the energy emitting device.

22. The system of claim 20 or 21 wherein the sensor  
20 is a temperature sensor which produces temperature signals representative of the temperature of the content.

23. The system of claim 22 when appended to claim 3  
25 wherein the temperature sensor is adapted in use to be operatively coupled to the energy emitting device to control the device so that it regulates the temperature of the content.

30 24. The system of any one of claims 20-23 wherein the sensor is operatively coupled to the control mechanism

such that the condition signals are inputtable to the control mechanism and the control mechanism is adapted to control the amount of energy emitted by the device in response to the condition signals to regulate the sensed condition in accordance with a prescribed regime.

25. The system of claim 15, 16 or 18 or any one of claims 19 to 24 when appended to claim 15, 16 or 18 wherein the prescribed regime for the sensed condition is programmed in the controller.

26. The system of claim 10 or any one of its dependents wherein the device has a regulator operable to regulate the amount of power transferred from the power supply to the electrically-powerable energy emitting element and the control mechanism is operably coupled to the regulator to cause, in use, the regulator to regulate the power transfer so that the energy emitting element emits energy in accordance with the prescribed regime.

27. The system of claims 24 and 26 or claims 25 and 26 in which the operation of the regulator is controlled by control signals produced by the control mechanism in response to the condition signals.

28. The system of claim 26 or 27 wherein the regulator is a power-on/power-off switch for the electrically-powerable energy emitting element.

29. The system of claim 26, 27 or 28 wherein the switch is a transistor.

30. The system of claim 29 wherein the transistor is  
5 a field effect transistor (FET).

31. The system of claim 10 or any one of its dependents wherein the control mechanism is adapted in use to operate to cause a continuous series of  
10 electrical pulses to be inputted to the electrically-powerable energy emitting element, the pulse durations and spacings being variable by the control mechanism to result in the energy emitted by the emitting element according with the prescribed regime.

15 32. The system of any one of claims 28-30 wherein the control mechanism is adapted in use to operate to cause a continuous series of electrical pulses to be inputted to the regulator, the pulse durations and  
20 spacings being variable by the control mechanism to result in the regulator operating to control the energy emitted by the emitting element in accordance with the prescribed regime.

25 33. The system of any one of the preceding claims wherein the device has a transmitter.

34. The system of any one of the preceding claims wherein the device has a receiver.

35. An energy delivery system for delivering energy to a content in a vessel, the system having:-

(a) a contactlessly-powerable energy emitting device which is adapted to be:-

- 5                   - positioned inside the vessel, and
- contactlessly-powered when inside the vessel to emit energy to the content;

(b) a power supply adapted in use to contactlessly-couple with the energy emitting device for powering  
10 thereof when inside the vessel;

(c) a sensor adapted in use to produce condition signals representative of a condition of the content; and

(d) a control mechanism adapted in use to control the  
15 amount of energy emitted by the energy emitting device in accordance with a prescribed regime.

36. The system of claim 35 wherein the energy is such as to affect the sensed condition and the control  
20 mechanism is adapted to (i) receive the condition signals, and (ii) vary the amount of energy emitted by the device in dependence of the condition signals to regulate the sensed condition in accordance with the prescribed regime.

25

37. The system of claim 35 or 36 wherein the control mechanism is adapted to operate to control the amount of energy emitted by the energy emitting device by regulating the power transferred to the device.

30

38. The system of claim 37 wherein the control mechanism operates to control the amount of energy emitted by pulse width modulation (PWM).

5 39. A stirrer for stirring a fluid having an energy emitting mechanism which is adapted to be contactlessly powered to emit energy into the fluid.

40. The stirrer of claim 39 which is a contactlessly-  
10 drivable stirrer.

41. The stirrer of claim 39 or 40 wherein the energy emitting mechanism is adapted to be contactlessly-  
15 powered by electromagnetic induction.

42. The stirrer of any one of claims 39-41 wherein the energy emitting mechanism has an electrically-powerable energy emitting mechanism which is contactlessly-powerable.  
20

43. The stirrer of any one of claims 39-42 having a control mechanism which is operatively coupled to the energy emitting mechanism for control thereof in accordance with a prescribed regime.  
25

44. The stirrer of claim 43 wherein the control mechanism has a programmable controller programmed to cause the energy emitting mechanism to operate in accordance with the prescribed regime.  
30



45. The stirrer of claim 44 wherein the controller is a PWM controller.

46. The stirrer of claim 42 wherein the electrically-powerable energy emitting mechanism has an electrically-powerable energy emitting element and the control mechanism has an electrical control circuit operatively coupled to the energy emitting element to control operation thereof.

10

47. The stirrer of claim 46 wherein the control circuit is adapted to be contactlessly coupled to an external power supply for forming a contactless power transfer link therewith.

15

48. The stirrer of any one of claims 39-47 wherein the energy emitting mechanism is a microelectronic device.

49. The stirrer of any one of claims 39-48 wherein the energy emitting mechanism is a heating mechanism.

50. The stirrer of any one of claims 39-49 further having a sensor for sensing a condition of the fluid and producing real-time condition signals representative of the condition.

51. The stirrer of claim 50 adapted such that, in use, the energy emitting mechanism is controlled in response to the condition signals.

30

52. The stirrer of claim 51 when appended to claim 43 wherein in use the condition signals are input to the control mechanism for processing thereof to produce a control signal for controlling operation of the energy emitting mechanism.

53. The stirrer of claim 52 wherein the control mechanism is adapted in use to control the energy emitting mechanism in response to the condition signals so that the energy emitted to the fluid is automatically regulated to maintain the fluid condition in accordance with a prescribed regime.

54. The stirrer of claim 43 or any one of its dependents wherein the control mechanism has a regulator for regulating the power input to the energy emitting mechanism and thereby regulating the energy emitted by the energy emitting mechanism.

55. The stirrer of claims 46 and 54 wherein the control mechanism is adapted in use to operate to cause the regulator to provide a continuous series of electrical pulses to the electrically-powerable energy emitting element, the pulse widths and spacings being such as to cause the energy emitting element to emit energy in accordance with the prescribed regime

56. The stirrer of any one of claims 50-53 wherein the sensor is a temperature sensor.

57. The stirrer of any one of claims 39-56 having a transmitter and/or a receiver.

58. A laboratory-scale reaction apparatus including  
5 the system of any one of claims 1-38.

59. A calorimeter including the system of any one of claims 1-38.